The Impact of Terms of Trade and its Volatility on Economic Growth: A Case of ASEAN Countries

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Abstract

In this paper, the main purpose is to analyze the relationship between terms of trade and its volatility on economic growth, considering that both net barter and income terms of trade and their volatilities are one of crucial factors to determine growth. By utilizing annual data of ASEAN countries, which are four emerging market economies, for the period 1981-2010, using Unit root test, Johansen cointegration test, and Impulse response function are discussed to accomplish this study. In this paper, Johansen cointegration technique has been adopted and found the existence of long run relation between GDP per capita and terms of trade and its volatility in ASEAN. Indonesian results of the level and volatility of net barter and income terms of trade have no effect on economic growth, with some exception of a moderated effect from income terms of trade on growth. Philippines' both terms of trade and its volatility leads to an obstacle and a stimulation to real domestic growth, respectively. Thailand's results show that an improvement in four types of terms of trade can enhance real GDP per capita.

Keywords: Net Barter Terms of Trade, Income Terms of Trade, Volatility, Economic Growth, ASEAN

Introduction

Background of the study

More economic integration will expand the volatility and uncertainty because of the close association, so the level and volatility in the terms of trade are directly converged or diverged depended on the world export-import prices. In light of this gap, this paper focuses on the empirical relationship between the level and volatility in the terms of trade on economic growth (real per capita gross domestic product) by considered Indonesia, the Philippines, and Thailand as the representative of ASEAN (the Association of Southeast Asian Nations) emerging markets using time series data. These three ASEAN countries are small emerging economies which their GDP depends heavily on their export sector. Furthermore, Gross domestic product (GDP) of emerging markets grows continually by heavily dependent on international trade, so the investigation in an effect of terms of trade on economic growth is beneficial to our nations because of almost 50 percent of GDP volatility explained by the term of trade variation (Mendoza, 1995, 1997).

For the past three decades or more, economic growth of many developing nations is mainly depended on exports their primary products which prices are much more fluctuated than the price of manufactured goods. Thanks to the international integration and an assistance of periphery's government in industrialization, many developing nations have developed the technological progress in their industrial sector. To obtain larger benefit and economic stability, emerging market economies which used to export their primary commodity to international markets have fostered industrialization and have increased the
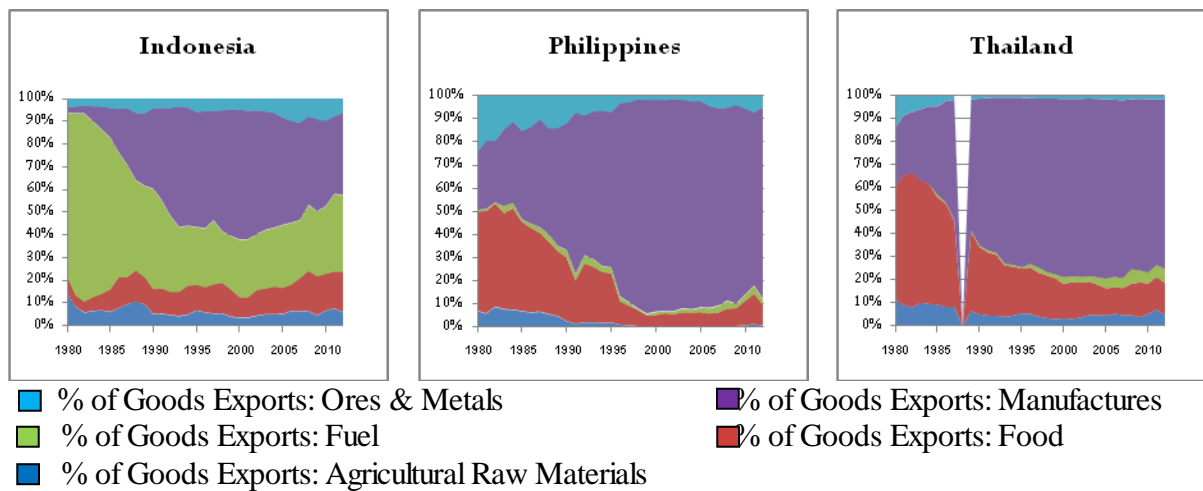
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shares of manufactures in total exports (Figure 1).

Figure 1. Three ASEAN Merchandise export shares (%)

☐ % of Goods Exports: Ores & Metals   ☐ % of Goods Exports: Manufactures
☐ % of Goods Exports: Fuel   ☐ % of Goods Exports: Food
☐ % of Goods Exports: Agricultural Raw Materials

Terms of Trade and Economic Growth

A number of prior literatures represent that an expansion of the terms of trade are an important determinants to boosting economic growth. To gain a basic understanding of net barter terms of trade and income terms of trade of each country, some researchers do their empirical evidences on specific countries (for example, Berge et al. 1997; Wong 2004; and Fatima 2010). Suggestive evidences of Kaneko (2000) and Cakir (2009) in answer to the positive impact of commodity terms of trade on growth exist in their studies.

Terms of Trade Volatility and Economic Growth

According to the essay of Sapsford and Balasubramanyam (1994), the trend and volatility in the terms of trade must be treated together as 'twin-pillars' for avoiding the problem of the less developed countries because export revenues from these countries depend mainly on primary commodities (but nowadays some countries strongly export components and manufactured goods). Even if Blattman et al. (2004) explain, the secular change is less and less important to account for accumulation and growth than is volatility.

Few decades ago, a large number of researchers take an interest in studying the relationship between level and volatility in the terms of trade and economic growth. Most of researches which explore the linkage of terms of trade and its volatility on economic growth are using cross-country evidence for considering the trend of many countries. The international trade is an important factor that drives the entire economy from low income country to become wealthy. In the three past decades, many researchers pay attention at the volatility in the terms of trade as an important factor that influences the economic growth as a result of the intention to stimulate the GDP. Export and import are the source of extending the economic growth. Numerous cross-country empirical results are confirmed the positive (negative) relationship of terms of trade (volatility) and growth (Basu and McLeod, 1992; Easterly and Kraay, 2000; Bleaney and Greenaway, 2001; Blattman, Hwang, and Williamson, 2003, 2004, 2007; Turnovsky and Chattopadhyay, 2003; Williamson, 2008; Mansfield and Reinhardt, 2008; Furth, 2010; Samimi, Sadeghi, and Sadeghi, 2011). The severe effect of the fluctuation in the terms of trade which affected on investor's decision had led to deteriorated GDP per capita growth.

Most recent work using solely net barter terms of trade to measure terms of trade but this paper uses both net barter terms of trade and income terms of trade to investigated the

impact of terms of trade and its volatility on economic growth (Lutz, 1994; Awel, 2012). Obviously, the relation of net barter terms of trade volatility and output growth is not negative as the hypothesis but it turns out to be positive while the relation of income terms of trade volatility is negative as assumption (Lutz, 1994). On the contrary, Awel finds that the volatility of net barter and income terms of trade have the significantly negative impact on economic growth. To make the fact precise, these two researchers whose indicates an opposite result in volatility can share similar results of the strong positive association of net barter and income terms of trade with economic growth. Unlike classical research results, a concept of positive volatility in the terms of trade on country's growth is illustrated in Mendoza's (1997) and Jawaid and Waheed's (2011) studies. From Mendoza's empirical study, he finds that the degree of risk aversion has directed affected on the sign of terms of trade uncertainty (they can be both positive and negative). When the risk aversion is low, the terms of trade volatility will decrease welfare and economic growth. He presents some simple results suggesting that an increase in growth and the mean rate of terms of trade makes higher consumption and economic growth. The empirical investigation of Jawaid et al. also confirms the significant positive effect of fluctuation in the terms of trade on economic growth; nevertheless, the explanation about positive sign in this paper is unlike previous research. They have claimed that the positive causality between terms of trade volatility and country's growth comes directly from globalization led these two factors move in the same direction. To the extent that liberalization and specialization are important factors to determine economic potential, the globalization bring shocks to country frequently, which is then increased both variability and growth.

Only few papers focus only on volatility in the terms of trade of specific nation without considering other countries. The main reason of researches that uses time series data is that the author would like to study the countries that do not include in other papers or just focus on their own target. Focusing on an individual country, all authors (Grimes, 2006; Borkin, 2006; Wong, 2010; Jawaid and Raza, 2012) corroborates the existence of a negative volatility in the terms of trade and a positive trend in terms of trade on domestic growth as the other numerical experiments.

Objective of the study

Main objective is to examine whether net barter terms of trade & income terms of trade (its volatility) have contributed significant positive (negative) long run relationship on economic growth by provided an empirical evidence on three countries (Indonesia, the Philippines, and Thailand) which are the representative of ASEAN emerging countries from 1981-2010.

Methodology

To this point, our econometric model to investigate the impact of terms of trade and its volatility on growth potential of the economy is derived by using the production function framework. The basic building block of our model will be the aggregate production function.

$$Y = f(A, L, K,) \tag{1}$$

Where Y is GDP per capita, L is labour force, K is capital stock and A is the total factor productivity (TFP) of growth in GDP per capita which is not described as factor of production: K and L. In order to make the reasonable assumption, the impact of terms of trade and its volatility on economic growth will operate through A.

$$A = G(NBTT, VNBTT, ITT, VITT) \tag{2}$$

Substituting (2) in (1), we obtain:

Y = f (L, K, NBTT, time dummy) (3.1); Y = f (L, K, VNBTT, time dummy) (3.2)

Y = f (L, K, ITT, time dummy)   (3.3); Y = f (L, K, VITT, time dummy) (3.4)

Based on a production function framework, the author uses the cointegration model and VECM impulse response to investigate the long run effect of mean terms of trade and its volatility on economic growth. The regression model in this study is specified in the form below.

$$\log Y_t = \beta_0 + \beta_1 \log K_t + \beta_2 \log L_t + \beta_3 TOT_t + D_1 + D_2 + e_t \qquad (4)$$

Where TOT is NBTT, ITT, VNBTT, and VITT, log is the natural logarithm, $NBTT_t$ is the level of net barter terms of trade, $VNBTT_t$ is volatility of net barter terms of trade, ITT_t is the level of income terms of trade, $VITT_t$ is volatility of income terms of trade, and D_1 and D_2 are dummy variables for capturing the Asian financial crisis between 1997 to 1998 and the global financial crisis of 2007-2009 impacts on Indonesia, the Philippines and Thailand. D_1 and D_2 equal to 1 for period from 1997 to 1998 as well as 2007-2009 and 0 for the rest, and e_t is the error term at time t. Owing to the unavailable data of capital stock, the author chooses real gross fixed capital formation in the percentage of GDP to proxy capital stock. I consider the Asian financial crisis and the global financial crisis using them as dummy variables to indicate the existence of crisis in our countries and to get more powerful, incorrect and stable model. This time dummy variables have be added to catch a harshly crisis since these two crisis has affected macroeconomic variables in ASEAN economies at that period.

Data description and sources

In this study, a time series data set is used consisting of annual data on Indonesia, the Philippines and Thailand during the 30-year period (1981-2010). GDP per capita, labor force, capital stock , and net barter terms of trade data are downloaded from World Bank's, UNCTAD's, and IMF's official database meantime net barter terms of trade volatility, income terms of trade, and income terms of trade volatility are computed by author's calculation. Real GDP per capita defines as the dependent variable while other variables define as explanatory variable. Real GDP per capita, capital, and labor data are reported in each country' current local currency (Rupiah, Peso, and Thai Baht) because using value from foreign countries' perspective like U.S. dollar has involved with exchange rate, so the result will not capture some alternation such as monetary policy regime and could lead to incorrect answer. To measure volatility in terms of trade, GARCH $(1,1)$[1] model is utilized in this study.

Results and Discussion

Before identifying the stationary of the variables, I investigate that time series variables are stationary by using Phillip Perror (PP) unit root test. Evidence for the PP test has expected non-stationary in level but become stationary in the first difference. The $\log O_t$[2]

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[1] To measure terms of trade volatility, many researcher can calculate it from these 4 methods; standard deviation, Generalized Autoregressive Conditional Heteroskedasticity model or GARCH (1,1), moving averages, and moving standard deviations. The author has choose GARCH (1,1) to proxy terms of trade volatility because of the limitation of online available data. An outstanding advantage of GARCH (1,1) estimator is that we could get a maximum number of volatility which is a little bit less than total frequency while the amount of volatility calculated by other methods is less than GARCH due to an inability to compute a single year. An unavoidable disadvantage of GARCH is unexplained reasons in volatility's variation and symmetry of volatility on both positive and negative signs of previous shocks.

[2] An extra exogenous variable $\log O_t$ represented an oil price is added for controlling the fluctuated effect of oil price change because Indonesia is the only fuel exporter in this region and the share of fuel export in total exports is quite high which will directly affect every endogenous variable in this country.

which is an additional exogenous variable in an Indonesian equation is also stationary in the first difference. The results show that the variables might have a long run relationship. The stationarity of error term checked from running simple linear OLS regression is necessary for choosing the following methods. If the calculated ADF statistics is higher than their critical values, then the residual series is stationary then variables in each equation have to be co-integrated. From the results, it is seen that residuals of all models are cointegrated at level. That is, all tests do not accept the null hypothesis that residual has a unit root at level. As the reason mention above, this study will adopted the VECM to analyze the long run relationship when error term is stationary at I(0).

Investigate the existence of a long run relationship of all variables by utilizing cointegration test of the Johansen and Jeuuselius (1990). For the results shown, there is the rejection of null hypothesis of no cointegration in four models of two types of terms of trade and its volatility at 5% level of significance by having one to three cointegrating vector. The existence of long run relationship among variables in Indonesia's, Philippines' and Thailand's four models can be proved by using both Johansen cointegration test and ADF test error term.

Specific country analysis in Indonesia, Philippines, Thailand

The graphs of four models in three ASEAN countries present the VECM impulses for any terms of trade shocks on the responses of GDP per capita, with some exceptional in Indonesia which considers an oil price as an additional exogenous variable in their models (Figure 2).

Indonesian three forth of terms of trade have no impact on real GDP growth because international trade in this country does not be the main driver of its economy (the left figure of Figure 3). However, domestic consumption in Indonesia plays an important role in driving economy around 70 percent of GDP during the 1980s-2000s because of the highest population in this country, then production line will emphasize on internal consumption. As a result above, it is not weird that net barter terms of trade have irresponsiveness to growth, hence it volatility will have non-impact on growth. Furthermore, income terms of trade seem to discourage economic growth by having a significant negative relation. The magnitude of sharply decreased net barter terms of trade is larger than an increase in export volume index, so the income terms of trade continually declined during 1980s. Furthermore, reduced crude oil price in the world market with the high share of fuel exports in its total exports can decline net barter terms of trade.

A supplementary time dummy variable will be added to catch an intensely internal crisis in Philippines during 1983-1986 as an exogenous variable since real GDP per head has declined in this period. To put the emphasis of negative impact from net barter and income terms of trade which are shocks into aspect, both responses in domestic GDP per capita growth have be impeded by two innovations in the terms of trade. The net barter terms of trade of this nation almost always stays below 100 which implies that the average price of imports is higher than export value per unit because actual economic growth of Philippines has elevated by internal consumption, for instance, the evidence in 1980s to 1995 and the last three years of 2000s (the middle figure in Figure 3). To confirm my fact findings by IMF report, economic growth of Indonesia and Philippines has obviously discouraged by terms of trade. This report gives the reasons that the terms of trade and an enhancement in global demand might have opposite movements (IMF, April 2014). Exact opposite results happen again in net barter and income terms of trade volatility along the whole ten periods according to the implicitly positive sign. The reason for positive relationship between terms of trade volatility and growth is that the influence of globalization particularly from trade integration in Philippines would lead to higher terms of trade volatility and higher economic potential.

The effect of level of net barter and income terms of trade on Thailand's economic growth is insignificant positive because an increase in net barter and income terms of trade will bring a rise in real GDP per capita for the entire time span. However, net barter and income terms of trade volatility enhances Thai domestic GDP growth-notably an unexpected positive relationships; nevertheless, net barter terms of trade volatility react significant during the short horizon. Even if ordinary empirical evidences found negative linked between terms of trade volatility and growth, globalization on trade openness can lead to higher terms of trade volatility and become the reason of higher economic potential. From the right figure of Figure 3, Thailand's degree of openness since 1988 is larger than domestic consumption, so the export will take part in determination of country's growth.
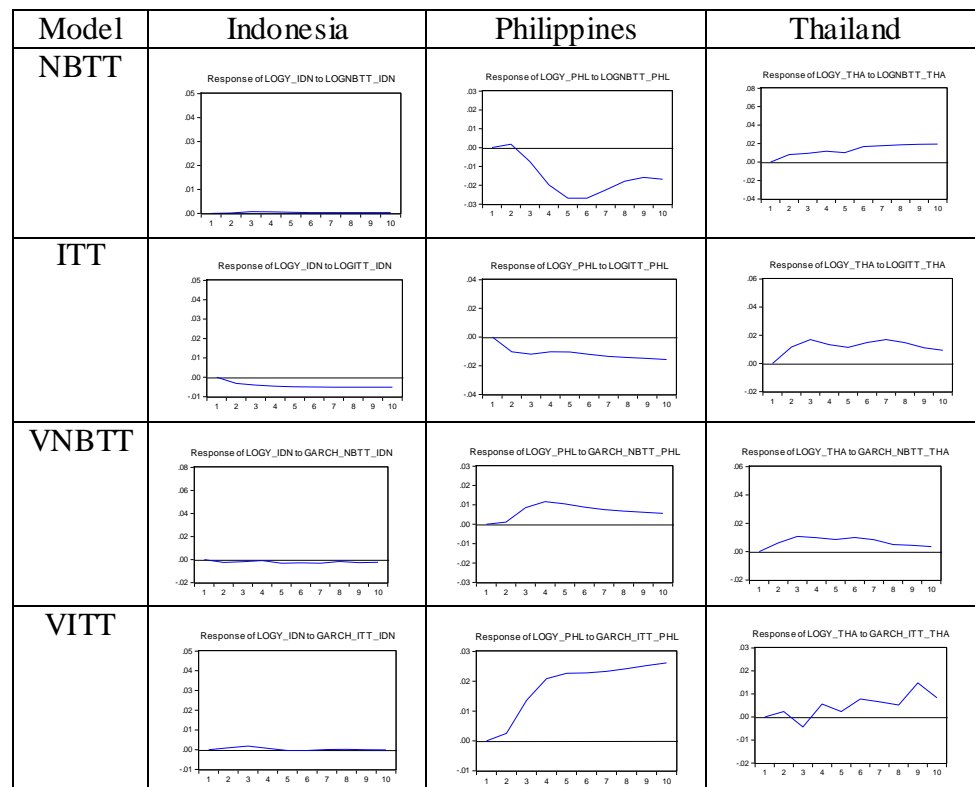

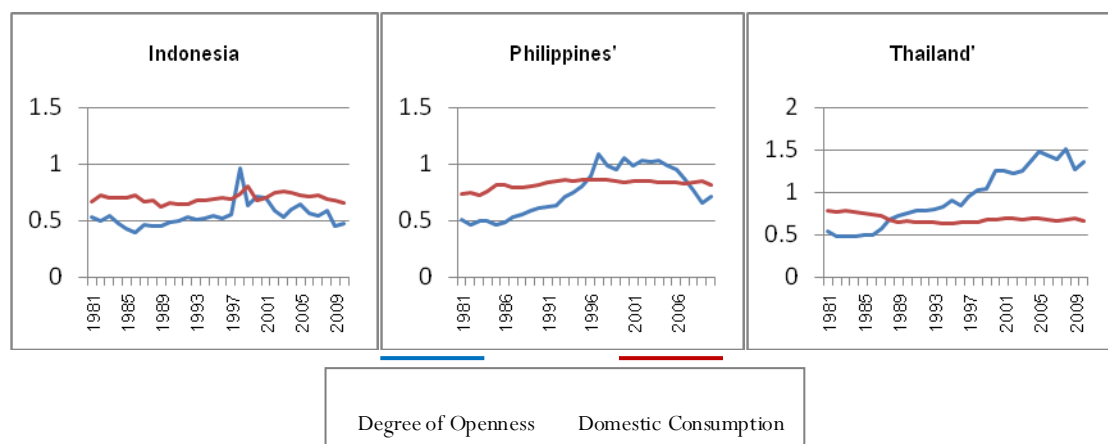**Figure 2** Graphs of Impulse Response Function in Indonesia, Philippines, and Thailand

Figure 3 Degree of Openness and Domestic Consumption in Indonesia, Philippines, and Thailand

Conclusion and Policy Implication

This paper proposes an empirical evidence of the long run relationship between terms of trade (its volatility) and economic growth by using Johansen cointegration and VECM impulse response analysis with annual time series data in case of Indonesia, Philippines, and Thailand over the period 1981-2010. The impacts of four types of terms of trade on economic growth are assessed through the impulse response functions. The implications of positive terms of trade and negative its volatility effects on economic growth calling for a more holistic approach are discussed as followed because the country's characteristic has an important effect on the positive or negative long run relationship. The unique results could be attributable to a variety of individual characteristics in each nation, therefore, it does not matter that we can not find conclusion in ASEAN countries. Some economy-specific differences appear in this study: for example, economies depended largely on its domestic consumption (for instance, Indonesia) show no relationship between terms of trade and its volatility on real GDP per capita growth except negative impact from income terms of trade. Even for Philippines in which has depended on its domestic consumption presents that whenever net barter and income terms of trade (their volatilities) grows (reduces), national real GDP growth will be enlarged. In Thailand, positive insignificant economic growth effects with respect to four types of terms of trade shocks is presented. A beneficial recommendation, policy planners and business man should produce export products with premium quality which have more value added to increase country's growth rate while government sector need to provide massive stimulus to support private sector.

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